

WHAT IS CLAIMED IS:

1. A circuit which decouples gains for a transmit signal and a receive signal of a broadband modem that is coupled to a telephone line, comprising:

a multi-port transformer including

- i) a line coil electrically coupled to the telephone line;
- ii) a linedriver coil electrically coupled to a broadband modem transmit line carrying the transmit signal of the broadband modem;
- iii) a receive coil electrically coupled to a broadband modem receive line carrying the receive signal of the broadband modem;
- iv) wherein said line coil, said linedriver coil and said receive coil are magnetically coupled to each other;

a bridge circuit electrically coupled between said multi-port transformer and the broadband modem receive line; and

a pair of line matching resistors electrically coupled between said multi-port transformer and the broadband modem transmit line, wherein each the line matching resistors match the telephone line resistance.

2. A circuit of claim 1, wherein a turns ratio of said linedriver coil to said line coil is 1:N and a turns ratio of said receive coil to said line coil is M:N.

3. A circuit of claim 1, wherein said bridge circuit is coupled to the broadband modem transmit line and subtracts the transmit signal from the receive signal.

4. A circuit of claim 1, wherein the broadband modem is an ADSL modem.

5. A circuit of claim 1, wherein the broadband modem is a VDSL modem.

6. A circuit of claim 1, wherein the broadband modem is a HDSL modem.

7. A circuit of claim 1 which isolates narrowband voice signals from broadband signals, wherein

- i) said line coil includes a first line coil, a line capacitor and a second line coil,
- ii) wherein said linedriver coil includes a first linedriver coil, a linedriver capacitor and a second linedriver coil,
- iii) wherein said receive coil includes a first receive coil and a second receive coil, wherein a node between the first receive coil and the second receive coil is coupled to ground.

8. A broadband modem for coupling a broadband signal to a telephone line, comprising:

- a transmit circuit that provides a modem transmit signal;
- a receive circuit that receives a modem receive signal;
- a hybrid circuit coupled to said transmit circuit and said receive circuit which decouples gains for the modem transmit signal and the modem receive signal.

9. The broadband modem of claim 8, wherein said hybrid circuit comprises:

- a multi-port transformer including
 - i) a line coil electrically coupled to the telephone line;

- ii) a linedriver electrically coupled to a broadband modem transmit line carrying a transmit signal of said transmit circuit;
- iii) a receive coil electrically coupled to said receive circuit carrying a receive signal of the receive circuit;
- iv) wherein said line coil, said linedriver coil and said receive coil are magnetically coupled to each other;

a bridge circuit electrically coupled between said multi-port transformer and said receive circuit; and

a pair of line matching resistors electrically coupled between said multi-port transformer and said transmit circuit, wherein each the line matching resistors match the telephone line resistance.

10. A broadband modem of claim 9, wherein within said hybrid circuit a turns ratio of said linedriver coil to said line coil is 1:N and a turns ratio of said receive coil to said line coil is M:N.

11. A broadband modem of claim 8, wherein the broadband signal is an ADSL signal.

12. A broadband modem of claim 8, wherein the broadband signal is a VDSL signal.

13. A broadband modem of claim 8, wherein the broadband signal is a HDSL signal.